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ABSTRACT

This paper presents the results of a comparative analysis between full term typical infants and those born micropremature in the developmental construct of mastery motivation. The sample consisted of 10 micropremature infants with developmental levels within the normal limits and 10 full term 9- to 12-month-olds (adjusted for prematurity) matched by age and gender. For the micropremature group, mean birth weight was 756.4 grams with a gestational age of 25.5 weeks. The average length of time on oxygen for the micropremature infants was 97.6 days. Two were reported to have retinopathy of prematurity, and one was reported to have a grade III intraventricular hemorrhage. Results indicated the full term groups demonstrated significantly more intervals of task persistence than the micropremature group in problem-solving tasks. Consistent with previous research, most infants did not show any pleasure or displeasure. However, a few infants exhibited high levels of task pleasure, which was observed more frequently in the full term group. The full term group also completed significantly more solutions in the problem-solving tasks that the micropremature group. For the micropremature group, there was a highly significant correlation in task persistence between the effect production and practicing sensorimotor skills task categories. Overheads explaining the study and the results are provided. (CR)

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Behavioral Indicators of Microprematurity

Through the Lens of Mastery Motivation

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Empirical evidence suggests that the micropremature infant, born at no more than 27 weeks gestational age and 1,000 grams, presents with subtle difficulties in higher cognitive processing skills at school age, despite normal IQ and typical acquisition of early milestones when adjusting for prematurity. These findings may indicate that there is an under-identification of risk during the early intervention years as the subtle differences between micropremature and typical development may not be apparent to practitioners or families unless alternative areas of assessment are employed, such as mastery motivation.

Mastery motivation stimulates the child to explore, discover, and attempt new experiences that foster development. Mastery motivation has been described as the child's "stick-to-itiveness" observed in the process toward goal achievement. Previous research has uncovered differences in mastery motivation between premature and full-term infants however; there has not been an examination of the micropremature population separate from the larger premature infant. The purpose of the electronic poster session is to present the results of a comparative analysis between full-term typical infants and those born micropremature in the developmental construct of mastery motivation and to illustrate individual differences in behavioral approaches to mastery motivation opportunities of both micropremature and full-term infants and toddlers.

Three research questions were investigated in the current study: (1) Do infants born micropremature exhibit different mastery motivation than infants born full-term? (2) Do micropremature infants demonstrate variability in mastery motivation across different tasks? (3) Is this variability different from full-term infants? The sample consisted of 10 micropremature with developmental levels within normal limits and 10 full-term 9 through 12 month olds (adjusted for prematurity) matched by age (mean = 10.62 months adjusted premature, 10.59

months chronological full-term) and gender (6 males, 4 females). Mean birthweight of the full-term group was 3887 grams; mean gestational age was 40.15 weeks. For the micropremature group, mean birthweight was 756.4 grams with a gestational age of 25.5 weeks. The micropremature group had a mean Bayley MDI of 96.2 (s.d. = 8.7), with a range of 85-113. Through caregiver report, the average length of time on oxygen was 97.6 days, ranging from 31 to 180 days. Only two of the children were reported to have retinopathy of prematurity, and one child was reported to have a grade III intraventricular hemorrhage (IVH). No other IVH's were reported. Three children were from twin pregnancies.

The majority of children lived in two-parent households (90%). Maternal education was 14.8 years, ranging from 12 to 17 years. Annual household income ranged from $20,000 (10%) to over $70,000 (40%). The average hours of early intervention services received by the micropremature group was 2.32 hours per month, ranging from zero to six hours per month.

Mastery motivation was assessed using an adaptation of the *Individualized Assessment of Mastery Motivation* (Morgan, Busch-Rossnagel, Maslin-Cole, & Harmon, 1992). It was modified for the 9-12 month olds by using tasks developmentally appropriate for this younger age range, similar to those used in previous mastery motivation research, and piloted to ensure scalability. Infants were assessed while engaged with toys for four minutes that were deemed individually moderately challenging, and represented effect-production (EP), practicing sensorimotor skills (PSS), and problem-solving (PS) tasks.

Measures were coded at 15-second intervals for four minutes of infant behavior with one task from each of the three task categories. Task persistence, expected to be a measure of objective mastery motivation, was coded as the percentage of 15-second intervals where the infant demonstrated goal-directedness for the majority of the interval. Task pleasure and task

displeasure, representing affective mastery motivation, were derived from the percentage of task persistence intervals where the infant displayed positive or negative affect. Task competence was measured as the percentage of possible solutions per task completed by the infant within the 4-minute interval.

Comparisons between the micropremature and full-term groups were analyzed using t-test analyses.

Table 1. Between Group Comparison of Task Persistence

	Micropremature	**Full-Term**
Effect Production	Mean = 34.38 s.d = 29.65	Mean = 47.5 s.d = 34.26
Practicing Sensorimotor Skills	Mean = 30.00 s.d = 19.50	Mean = 29.38 s.d = 19.11
Problem Solving*	Mean = 20.00 s.d = 18.11	Mean = 35.63 s.d = 17.69
Total	Mean = 28.13 s.d =18.35	Mean = 42.5 s.d = 21.59

*p<.1

Table 2. Between Group Comparisons of Task Pleasure

	Micropremature	**Full-Term**
Effect Production	Mean = 10.83 s.d = 20.81	Mean = 12.32 s.d = 20.18
Practicing Sensorimotor Skills	Mean = 6.00 s.d = 18.97	Mean = 22.36 s.d = 36.99
Problem Solving*	Mean = 0.00 s.d = 0.00	Mean = 10.33 s.d = 18.40
Total	Mean = 6.23 s.d = 11.11	Mean = 11.77 s.d = 16.19

*p<.1

Table 3. Between Group Comparison of Task Displeasure

	Micropremature	Full-Term
Effect Production	Mean = 2.50 s.d. = 7.91	Mean = 0.00 s.d. = 0.00
Practicing Sensorimotor Skills	Mean = 0.00 s.d. = 0.00	Mean = 0.00 s.d. = 0.00
Problem Solving	Mean = 5.33 s.d. = 11.67	Mean = 2.50 s.d. = 7.91
Total	Mean = 1.69 s.d. = 3.83	Mean = 0.91 s.d. = 2.87

Table 4. Between Group Comparison of Task Competence

	Micropremature	Full-Term
Effect Production	Mean = 44.00 s.d. = 19.42	Mean = 46.17 s.d. = 21.96
Practicing Sensorimotor Skills	Mean = 36.95 s.d. = 26.13	Mean = 35.55 s.d. = 28.23
Problem Solving*	Mean = 5.83 s.d. = 10.96	Mean = 22.50 s.d. = 26.95
Total	Mean = 33.51 s.d. = 15.36	Mean = 37.36 s.d. = 19.28

*$p<.1$

The results indicated that the full-term group demonstrated significantly more intervals of task persistence than the micropremature group in PS tasks. Although not significant, the full-term group also demonstrated considerably more intervals of task persistence than the micropremature group when the three task categories were combined and with EP tasks. Consistent with previous research, most infants in both groups did not show any pleasure or displeasure. However, a few infants exhibited high levels of task pleasure, which was observed more frequently in the full-term group. The full-term group also completed significantly more solutions in the PS tasks than the micropremature group

Within group comparisons were made across the three task categories using bivariate correlations. For the micropremature group, there was a highly significant correlation in task

persistence between the EP and PSS task categories ($p<.001$). No other significant relationships were found. For the full-term group, there continued to be a significant relationship between these two task categories however, the significance was lower ($p<.05$). Additionally, there was a significant relationship between EP and PSS categories for the full-term group in task pleasure ($p<.05$).

The significant differences in task persistence, pleasure, and competence were seen in the problem solving tasks, with the micropremature infants demonstrating lower scores. Problem-solving tasks are hypothesized to be a higher level skill than the other two. While performance on the EP and PSS task categories are related for both groups, this relationship is more significant for the micropremature infants. The micropremature infants appear to be more competent and persistent in the lower two task categories, while the full-term infants are competent and persistent across the three task categories. While the small sample size limited the emergence of significant differences, the full-term and micropremature infants appear to exhibit different developmental profiles of mastery motivation despite both groups having developmental scores within normal limits. Including mastery motivation as an area for assessment in developmental evaluations may uncover subtle developmental differences not uncovered in current assessment practices which can be addressed in the infant and toddler years, and possibly ameliorate the effects of biological risk on future functioning.

The videotape, "*Mastery Motivation Profiles*", presented as part of the electronic poster session, illustrated the individual and varying developmental profiles of both micropremature and full-term infant and toddler mastery motivation. A Model of Behavioral Processes Toward Mastery is utilized to describe the individualized approaches toward mastery (see accompanying handout).

References

Morgan, G., Busch-Rossnagel, N., Maslin-Cole, C., & Harmon, R. (1992). *Individualized Assessment of Mastery Motivation: Manual for 15 to 36 month old children.* Unpublished document, Fordham University, Department of Psychology.

This project is supported by the U.S. Department of Education, Office of Special Education Programs (OSEP). Opinions expressed herein are those of the authors and do not necessarily represent the position of the U.S. Department of Education.

Behavioral Indicators of Micropremature Through the Lens of Mastery Motivation

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Research Questions

- Do infants born micropremature exhibit different mastery motivation than infants born full-term?
- Do micropremature infants demonstrate variability in mastery motivation across different tasks?
- Is this variability different from full-term infants?

Definition of Micropreprematurity

Infants born no more than:

27 weeks

And

1,000 grams

Sample

10 micropremature infants between 9 and 12 months adjusted age

(Average Bayley MDI = 96.2,

s.d. = 8.7, range = 85-113)

10 full-term infants between 9 and 12 months chronological age

Matched groups for age and gender

Mastery Motivation

"A psychological force that stimulates an individual to attempt independently, in a focused and persistent manner, to solve a problem, or master a skill or task which is at least moderately challenging for him or her"

(Morgan, et al., 1990, p. 319)

Group Comparisons

	Premature	Full-term
Age (months)	10.62	10.59
Gestational Age* (weeks)	25.5	40.15
Birthweight* (grams)	756.4	3887

* p<.0001

Micropremature Medical Characteristics

Presence of IVH: 10% Grade 3

90% no IVH

Average Length of Time on Oxygen:

97.6 days, s.d. = 42.98, range = 31 – 180

Presence of ROP: 20% ROP

80% no ROP

Micropremature Demographic Characteristics

Two-parent households = 90%

Twins = 30% **Singletons** = 70%

Average Maternal Education: 14.8 years

s.d. = 1.47, range = 12 – 17

Household Annual Income:

$20,000 = 10% $30,000 = 30%

$50,000 = 10% $60,000 = 10%

>$70,000 = 40%

Early Intervention Services for Micropremature Sample

Average hours per month = 2.32

s.d. = 2.06, range = 0 – 6

No Services = 30%

1 – 2 hours/month = 20%

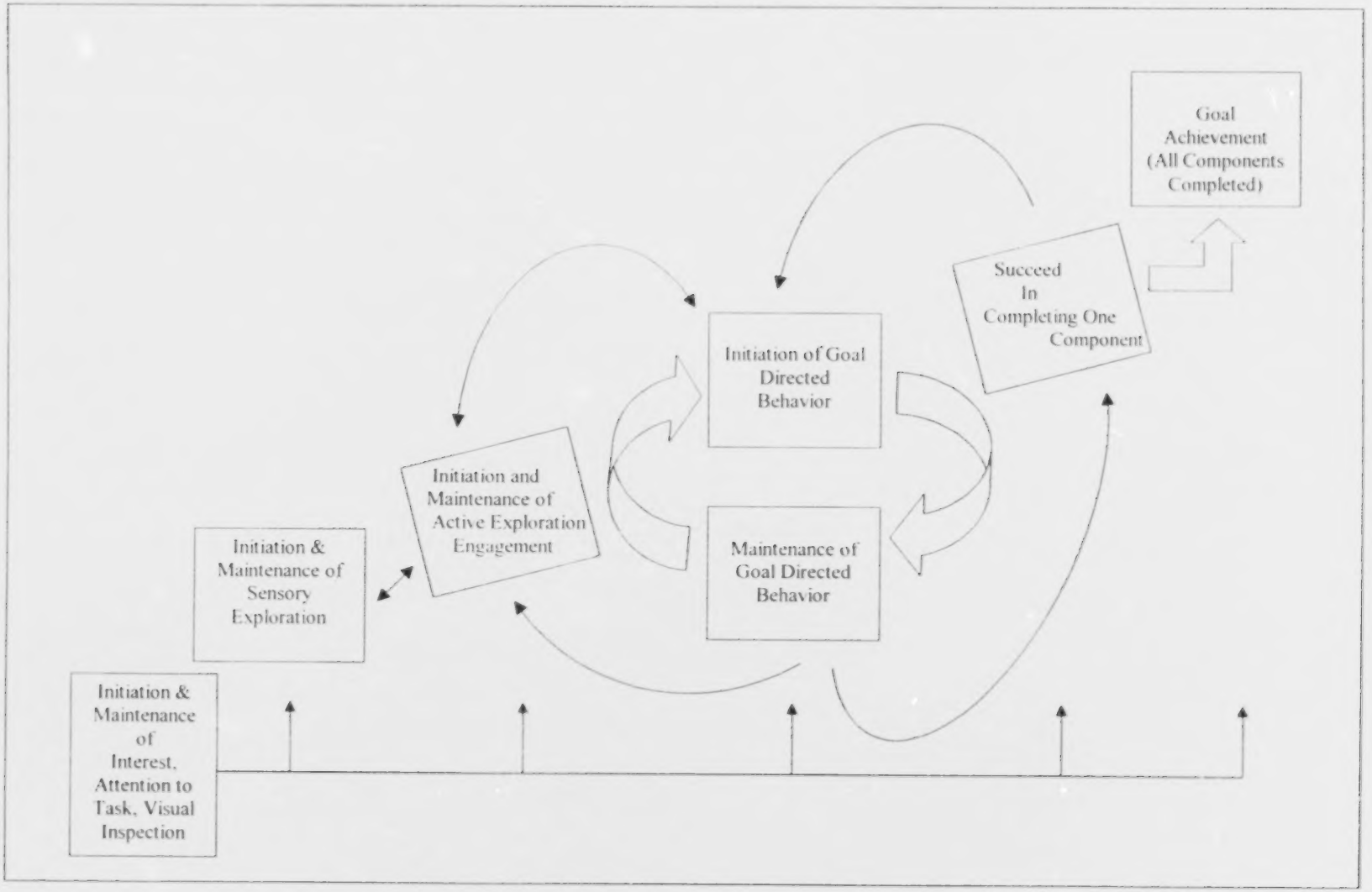
3 – 4 hours/month = 40%

6 hours/month = 10%

Model of Behavioral Processes Toward Mastery

- Sustained interest, attention to task, and visual inspection needed throughout goal-directed activity
- Child begins to accomplish a goal by examining task properties through visual inspection, sensory exploration, and active exploration
- Child initiates and maintains goal-directed behaviors to persist and successfully accomplish one component of the task
- Child may return to active exploratory behaviors to further understand the task properties during this period of goal-directedness
- Once the child completes one component of the task, the child returns to goal-directed behaviors to accomplish another task component
- Child repeats the process until the entire goal is accomplished
- When all the components have been successfully completed, the child has accomplished the goal

Model of Behavioral Processes Towards Mastery


Goal Achievement (All Components Completed)
Succeed In Completing One Component
Initiation of Goal Directed Behavior
Initiation and Maintenance of Active Exploration Engagement
Initiation & Maintenance of Sensory Exploration
Maintenance of Goal Directed Behavior
Initiation & Maintenance of Interest, Attention to Task, Visual Inspection

Research Design

- **Design:** Comparative analysis between full-term and micropremature infants with development within normal limits
- **Outcome:** Mastery motivation using the *Individualized Assessment of Mastery Motivation* (Morgan, et al., 1992) adapted for the 9-12 month level
- **Individually challenging tasks in:**
  - Effect Production (EP)
  - Practicing Sensorimotor Skills (PSS)
  - Problem Solving (PS)

Results – Task Persistence

	Micropremature	Full-Term
Effect Production	Mean = 34.38 s.d = 29.65	Mean = 47.5 s.d = 34.26
Practicing Sensorimotor Skills	Mean = 30.00 s.d = 19.50	Mean = 29.38 s.d = 19.11
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	Micropremature	Full-Term
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Problem Solving	Mean = 5.33 s.d. = 11.67	Mean = 2.50 s.d. = 7.91
Total	Mean = 1.69 s.d. = 3.83	Mean = 0.91 s.d. = 2.87

Results - Competence

	Micropremature	Full-Term
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Problem Solving*	Mean = 5.83 s.d. = 10.96	Mean = 22.50 s.d. = 26.95
Total	Mean = 33.51 s.d. = 15.36	Mean = 37.36 s.d. = 19.28

*p<.1

Results

- The full-term group demonstrated significantly more intervals of task persistence than the micropremature group in PS tasks
- Although not significant, the full-term group demonstrated considerably more intervals of task persistence than the micropremature group overall and with EP tasks
- There is a large range of task pleasure/displeasure in both groups, with most infants not showing any pleasure or displeasure

Results Continued

- The full-term group completed significantly more solutions in the PS tasks than the micropremature group
- Performance on EP and PSS are highly related. This relationship is more significant in the micropremature than the full-term group
- PS tasks were not related to the other tasks in either category
- The micropremature and full-term groups exhibited different profiles of mastery motivation across the three task categories

Conclusions

- The small sample size limits the emergence of significant differences however full-term infants appear to demonstrate more mastery motivation than micropremature infants despite no differences in competence
- Problem solving tasks appear to be different from effect production and sensorimotor tasks, hypothesized from the literature to be a higher level task. Full-term infants demonstrate more mastery motivation than micropremature infants in this high level task category
- Consistent with previous studies, affect during mastery tasks is rare in infants

Measures

Coded at 15-second intervals for 4 minutes of task attempts

- **Task Persistence:** Percentage of intervals where the infant demonstrates goal-directedness for the majority of the interval
- **Task Pleasure/Displeasure:** Percentage of task persistence intervals where the infant displayed positive or negative affect
- **Task Competence:** Percentage of possible solutions completed by the infant within the 4-minute interval

Within Group Differences - Micropremature

Significant Correlations

Task Persistence:

EP & PSS, $p<.001$

No significant relationships among task categories in positive or negative affect, or task competence

Within Group Differences – Full-Term

Significant Correlations

Task Persistence:

EP & PSS $p<.05$

Positive Affect:

EP & PSS $p<.01$

No significant relationships among task categories in competence or negative affect

Observing Behaviors Toward Mastery

- Does the infant engage in sustained attention to the mastery motivation opportunity?
- How does the infant approach the mastery motivation opportunity?
- Does the infant exhibit task directed behaviors?
- What types of activities does the child utilize the most task directed behaviors?

Observing Behaviors Toward Mastery

- How much time does the child spend in task directed versus exploratory behaviors?
- What variety of task directed behaviors does the infant utilize?
- Does the child return to task directed behaviors after engaging in exploratory behaviors?
- Does the child acknowledge completion of the task?